We claim:

Sub B1

1. A combinatorial chemical synthesis reaction tool, comprising:

a reaction vessel,

a reaction vessel support disposed to hold the reaction vessels in a preferred orientation,

an injection port, including a pressure seal, situated to provide access to said reaction vessel for the injection of liquids into said reaction vessel,

an evacuation port, including a pressure seal, situated to provide access to said reaction vessel for the evacuation of fluids from said reaction vessel, and

injection and evacuation fittings formed to matingly engage said respective injection and evacuation ports and to thereby enable the delivery of fluids to the reaction vessel and the evacuation of fluids from said reaction vessel.

2. The reaction tool of claim 1, wherein said injection port is located at the top of said reaction vessel.

3. The reaction tool of claim 2, wherein said evacuation port is located at the top of said reaction vessel.

4. The reaction tool of claim 2, wherein said evacuation port is located at the bottom of said reaction vessel.

5. The reaction tool of claim 1, further comprising:

a supplying vessel, and flexible tubing connected directly from said injection fitting to said supplying vessel.

6. The reaction tool of claim 5, further comprising:

a receiving vessel, and

flexible tubing connected directly from said evacuation fitting to said receiving vessel.

7. The reaction tool of claim 1, wherein said evacuation port is a spring-loaded port.

8. The reaction tool of claim 1, wherein said reaction vessel support comprises:

top and bottom vessel support plates with tapered injection through fittings.

9. The reaction tool of claim 8 further comprising an actuator to selectively control movement of the top and bottom vessel support plates.

10. The reaction tool of claim 8 wherein the top and bottom support plates form a carousel and the tapered injection through fittings are formed in a ring around the periphery of said top carousel vessel support plate and tapered evacuation fittings formed in a matching ring around the periphery of said bottom vessel support carousel plate.

11. The reaction tool of claim 10, further comprising:

a top carousel fitting plate with fittings arranged in a ring around the periphery of said top carousel fitting plate to match the tapered injection through fittings of said top carousel vessel support plate.

12. The reaction tool of claim 11, further comprising:

a bottom carousel fitting plate with fittings arranged in a ring around the periphery of said bottom carousel fitting plate to match the tapered evacuating through fittings of said bottom carousel vessel support plate.

13. The reaction tool of claim 12, wherein said top and bottom carousel fitting plates close to simultaneously engage the injection fittings of said carousel top fitting plate with the tapered injection through fittings of said top carousel

vessel support plate and to simultaneously engage the evacuating fittings of said bottom carousel fitting plate with the tapered through fittings of said bottom carousel vessel support plate.

14. The reaction tool of claim 13, wherein said vessel support carousel is connected to rotate under control of a motor to thereby align fittings and through fittings in a desired manner when said fitting plates are disengaged.

15. The reaction tool of claim 14, wherein said vessel support carousel is reciprocally moved to agitate the reaction vessel.

16. The reaction tool of claim 13, wherein the top and bottom carousel plates can be selectively moved to agitate the reaction vessel.

17. The reaction tool of claim 1, further comprising:

a stirring motor with a magnet attached to its shaft, said magnet positioned adjacent a sidewall of said reaction vessel; and

a stirring bar located within said reaction vessel, said stirring bar tending to follow the rotation of said magnet.

18. The reaction tool of claim 1, further comprising:

electromagnetic coils mounted around the outside of said reaction vessel, and

a tapered whisk stirrer located within said reaction vessel, said stirrer being responsive to varying magnetic fields produced by said push-pull coils by rotating within said reaction vessel, thereby stirring the contents of said vessel.

19. The reaction tool of claim 1, further comprising:

electromagnetic push-pull coils mounted adjacent the outside of said reaction vessel, and

a floating stirrer located within said reaction vessel said stirrer being responsive to varying magnetic fields produced by said push-pull coils by rotating within said reaction vessel, thereby stirring the contents of said vessel.

20. The reaction tool of claim 1, further comprising:

a resistive heater which snaps on to the exterior of said reaction vessel.

21. The reaction tool of claim 20, wherein said resistive heater includes means for selective on-line control.

22. The reaction tool of claim 1, further comprising a U-valve formed of flexible tubing and connected to regulate the flow of liquids from said evacuation through fitting.

Sub B2> 23. A universal fluid exchanger comprising:

a reaction vessel;

a reaction vessel support disposed to hold the reaction vessels in a preferred orientation;

an injection port, including a pressure seal, situated to provide access to said reaction vessel for the injection of liquids into said reaction vessel;

an evacuation port, including a pressure seal, situated to provide access to said reaction vessel for the evacuation of fluids from said reaction vessel;

injection and evacuation fittings formed to matingly engage said respective injection and evacuation ports and to thereby enable the delivery of fluids to the reaction vessel and the evacuation of fluids from said reaction vessel; and

an actuator for controlling selectively aligning the injection and evacuation ports and the injection and evacuation fittings, respectively.

24. The fluid exchanger of claim 23, wherein said injection port is located at the top of said reaction vessel.

25. The fluid exchanger claim 24, wherein said evacuation port is located at the top of said reaction vessel.

26. The fluid exchanger of claim 24, wherein said evacuation port is located at the bottom of said reaction vessel.

27. The fluid exchanger of claim 23, further comprising:
a supplying vessel; and
flexible tubing connected directly from said injection fitting to said supplying vessel.

28. The fluid exchanger of claim 23, further comprising:
a receiving vessel; and
flexible tubing connected directly from evacuation fitting to said receiving vessel.

29. The fluid exchanger of claim 23, wherein said evacuation post is a spring-loaded port.

30. The fluid exchanger of claim 23, wherein said reaction vessel support further comprises:
top and bottom carousel vessel support plates with tapered injection through fittings formed in a ring around the periphery of said top carousel vessel support plate and tapered evacuation fittings formed in a matching ring around the periphery of said bottom vessel support carousel plate.

31. The fluid exchanger of claim 30, further comprising:
a top carousel fitting plate with fittings arranged in a ring around the periphery of said top carousel fitting plate to match the tapered injection through fittings of said top

carousel vessel support plate.

32. The fluid exchanger of claim 31, further comprising:
a bottom carousel fitting plate with fittings arranged in a ring around the periphery of said bottom carousel fitting plate to match the tapered evacuating through fittings of said bottom carousel vessel support plate.

33. The fluid exchanger of claim 32, wherein said top and bottom carousel fitting plates close to simultaneously engage the injection fittings of said carousel top fitting plate with the tapered injection through fittings of said top carousel vessel support plate and to simultaneously engage the evacuation fittings of said bottom carousel fitting plate with the tapered through fittings of said bottom carousel vessel support plate.

34. The fluid exchanger of claim 33, wherein said actuator is connected to said vessel support carousel causes it to rotate under control of a motor to thereby align fittings and through fittings in a desired manner when said fitting plates are disengaged.

35. The fluid exchanger of claim 23, further comprising:
a stirring motor with a magnet attached to its shaft, said magnet positioned at the sidewall of said reaction vessel; and
a stirring bar located within said reaction vessel, said stirring bar being responsive to the rotation of said magnet by similarly rotating.

36. The fluid exchanger of claim 23, further comprising:
electromagnetic coils mounted to the exterior of said reaction vessel; and
a tapered whisk stirrer located within said reaction vessel, said stirrer being responsive to varying magnetic fields produced by said coils by rotating within said reaction vessel,

thereby stirring the contents of said vessel.

37. The fluid exchanger of claim 23, further comprising:

electromagnetic coils mounted to the exterior of said reaction vessel; and

a floating stirrer located within said reaction vessel said stirrer being responsive to varying magnetic fields produced by said coils by rotating within said reaction vessel, thereby stirring the contents of said vessel.

38. The fluid exchanger of claim 23, further comprising:

a resistive heater which snaps on to the exterior of said reaction vessel.

39. The fluid exchanger of claim 38, wherein said resistive heater includes a controller for on-line control.

40. The fluid exchanger claim 23, further comprising a U-valve formed of flexible tubing and connected to regulate the flow of liquids from said evacuating through fitting.

41. The fluid exchanger of claim 34, wherein said supplying vessels are connected to supply reagents and solvents for use in combinatorial chemical synthesis.

42. The fluid exchanger of claim 41, wherein the actuator further comprises a carousel rotation motor connected to rotate said vessel support carousel; and said fluid exchanger further comprises:

a resistive heater which snaps on to the exterior of said reaction vessel,

a stirring motor with a magnet attached to its shaft, said magnet positioned at the sidewall of said reaction vessel; and

a controller connected to control said carousel rotation motor, said resistive heater and said stirring motor.

43. The fluid exchanger of claim 42, further comprising:

a plurality of reaction vessels, each having a resistive heater snapped on to its exterior; and

a plurality of stirring motors positioned at the sidewalls of said reaction vessels, with each resistive heater and each stirring motor connected for stored program control by said controller.

44. A method for automatically exchanging fluids within one or more reaction vessels held in a vessel support structure, comprising the steps of:

a) positioning a reaction vessel to receive reactant from an injection fitting;

b) engaging the reaction vessel with the injection fitting;

c) determining whether all the desired reactants are contained within all the appropriate reaction vessels;

d) disengaging the injection fittings and returning to step a) if more reactants are desired;

e) if the determination is made in step c) that no more reactants are required, determining whether the reactants are at a desired temperature;

f) heating reactants which require heating and returning to step e); and

g) stirring reactants within reaction vessels.

45. The method of claim 44, further comprising the steps of:

h) determining whether more reactants are required for any of the reaction vessels and proceeding to step d) if more reactants are required;

i) aligning reaction vessels with evacuation fittings if no further reactants are required; and

j) engaging evacuation fittings with reaction vessels and evacuating contents from a reaction vessel.

46. An integral heater and stirrer for clip on attachment to a reaction vessel comprising:

a clip;

a mounting platform having a port, said mounting platform attached to the clip;

a temperature coefficient of resistance heater pad attached to the clip;

a stirring motor having a shaft with a magnet at its end; and

a bushing whereby the stirring motor is mounted through the bushing so that when the integral heater and stirrer is clipped to the reaction vessel, the magnet is properly spaced with respect to a sidewall of the reaction vessel and the clip supports both said heater pad and said stirring motor.